

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, TTL, QUADRUPLE BUS BUFFER GATES WITH
THREE-STATE OUTPUTS, MONOLITHIC SILICON

This specification is approved for use by Rome Air Development Center,
Department of the Air Force, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon, TTL, quadruple bus buffer gates with three-state outputs. Two product assurance classes and a choice of case outline and lead finishes are provided and are reflected in the complete part number.

1.2 Part number. The part number shall be in accordance with MIL-M-38510, and as specified herein.

1.2.1 Device type. The device type shall be as follows:

<u>Device type</u>	<u>Circuit</u>
01	Quadruple bus buffer gate (inverting control input)
02	Quadruple bus buffer gate (noninverting control input)

1.2.2 Device class. The device class shall be the product assurance level as defined in MIL-M-38510.

1.2.3 Case outline. The case outlines shall be designated as follows:

<u>Outline letter</u>	<u>Case outline (see MIL-M-38510, appendix C)</u>
C	D-1 (14-lead, 1/4" x 3/4") dual-in-line package
D	F-2 (14-lead, 1/4" x 3/8") flat package

1.3 Absolute maximum ratings.

Supply voltage range - - - - -	- 0.5 V dc to +7.0 V dc
Input voltage range - - - - -	- 1.5 V dc at -12 mA to 5.5 V dc
Storage temperature range - - - - -	- 65°C to +150°C
Maximum power dissipation (P_D) 1/ - - - -	
Type 01 - - - - -	303 mW dc
Type 02 - - - - -	347 mW dc
Lead temperature (soldering, 10 seconds) - -	+ 300°C
Thermal resistance, junction-to-case (θ_{JC}):	
Case C and D - - - - -	(see MIL-M-38510, appendix C)
Junction temperature (T_J) 2/ - - - - -	+ 175°C

1/ Must withstand the added P_D due to short circuit test (e.g., I_{OS}).

2/ Maximum junction temperature shall not be exceeded except for short duration burn-in screening conditions per method 5004 of MIL-STD-883.

| Beneficial comments (recommendations, additions, deletions) and any pertinent data |
| which may be of use in improving this document should be addressed to: Rome Air |
| Development Center (RBE-2), Griffiss AFB, NY 13441, by using the self-addressed |
| Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of |
| this document or by letter. |

1.4 Recommended operating conditions.

Supply voltage (V_{CC}) - - - - -	4.5 V dc minimum to 5.5 V dc maximum
Minimum high-level input voltage (V_{IH}) - -	2.0 V dc maximum
Maximum low-level input voltage (V_{IL}) - -	0.8 V maximum
Case operating temperature range (T_C) - -	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specifications and standards. Unless otherwise specified, the following specifications and standards, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Detail specification. The individual item requirements shall be in accordance with MIL-M-38510, and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Logic diagrams and terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Schematic circuits. Schematic circuits shall be submitted to the preparing activity prior to inclusion of a manufacturer's device in the specification and shall be submitted to the qualifying activity and agent activity (DESC-ECS) as a prerequisite for qualification. All qualified manufacturers schematics shall be maintained by the agent activity and will be available upon request.

3.2.3 Case outlines. The case outlines shall be as specified in 1.2.3.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 and 6.4 herein.

3.4 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I, and apply over the full recommended case operating temperature range.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$	Device type	Limits		Unit
				Min	Max	
Input clamp voltage	V_{IC}	$V_{CC} = 4.5 \text{ V}$, $I_{IN} = -12 \text{ mA}$	01,02		-1.5	V
High level output voltage	V_{OH}	$V_{CC} = 4.5 \text{ V}$, $I_{OH} = -2 \text{ mA}$	01,02	2.4		V
Low level output voltage	V_{OL}	$V_{CC} = 4.5 \text{ V}$, $I_{OL} = 16 \text{ mA}$	01,02		0.4	V
Off-state (high- impedance state) output current	$I_{O(\text{off})1}$	$V_{CC} = 5.5 \text{ V}$, $V_{OH} = 2.4 \text{ V}$	01,02		40	μA
Off-state (high- impedance state) output current	$I_{O(\text{off})2}$	$V_{CC} = 5.5 \text{ V}$, $V_{OL} = 0.4 \text{ V}$	01,02		-40	μA
Input current at maximum input voltage	I_{IH1}	$V_{CC} = 5.5 \text{ V}$, $V_{IH} = 5.5 \text{ V}$	01,02		100	μA
Input current at minimum input voltage	I_{IH2}	$V_{CC} = 5.5 \text{ V}$, $V_{IH} = 5.5 \text{ V}$	01,02		100	μA
High level input current	I_{IH3}	$V_{CC} = 5.5 \text{ V}$, $V_{IH} = 2.4 \text{ V}$	01,02		40	μA
Low level input current	I_{IL}	$V_{CC} = 5.5 \text{ V}$, $V_{IL} = 0.4 \text{ V}$	01,02	-.7	-1.6	mA
Supply current	I_{CC}	$V_{CC} = 5.5 \text{ V}$, data inputs = 0 V, output controls = 4.5 V	01		54	mA
Supply current	I_{CC}	$V_{CC} = 5.5 \text{ V}$, data inputs = 0 V, output controls = 0 V	02		62	mA
Short circuit output current ^{1/}	I_{OS}	$V_{CC} = 5.5 \text{ V}$	01,02	-30	-70	mA
Propagation delay time (high-to-low level)	t_{PHL}	$C_L = 50 \text{ pF} \pm 10\%$ $V_{CC} = 5.0 \text{ V}$	01,02	2	22	ns

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$	Device type	Limits		Unit
				Min	Max	
Propagation delay time (low-to-high level)	t _{PLH}	C _L = 50 pF ±10% V _{CC} = 5.0 V	01,02	2	16	ns
Output enable time to high level	t _{PZH}	V _{CC} = 5 V, C _L = 50 pF ±10%	01 02	2 2	20 22	ns
Output enable time to low level	t _{PZL}	V _{CC} = 5 V, C _L = 50 pF ±10%	01,02	2	30	ns
Output disable time from high level	t _{PHZ}	V _{CC} = 5 V, C _L = 50 pF ±10%	01 02	2 2	21 31	ns
Output disable time from low level	t _{PLZ}	V _{CC} = 5 V, C _L = 50 pF ±10%	01 02	2 2	20 27	ns

1/ Not more than one output should be shorted at a time.

3.5 Electrical test requirements. The electrical test requirements for each device class shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table III.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (see table III)	
	Class S devices	Class B devices
Interim electrical parameters (pre burn-in) (method 5004)	1	1
Final electrical test parameters (method 5004)	1*,2,3,9	1*,2,3,9
Group A test requirements (method 5005)	1,2,3,9, 10,11	1,2,3,9
Group B test requirements (method 5005) subgroup 5	1,2,3,9, 10,11	N/A
Group C end-point electrical parameters (method 5005)	N/A	1,2,3
Additional electrical subgroups for group C periodic inspections	None	10,11
Group D end-point electrical parameters (method 5005)	1,2,3	1,2,3

*PDA applies to subgroup 1 (see 4.2c).

3.6 Marking. Marking shall be in accordance with MIL-M-38510.

3.7 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 2 (see MIL-M-38510, appendix E).

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and methods 5005 and 5007, as applicable, of MIL-STD-883, except as modified herein.

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to qualification and quality conformance inspection. The following additional criteria shall apply:

a. Burn-in (method 1015 of MIL-STD-883).

(1) Test condition D or E, using the circuit shown on figure 2, or equivalent.

(2) $T_A = +125^\circ\text{C}$ minimum.

b. Interim and final electrical test parameters shall be as specified in table II, except interim electrical parameters test prior to burn-in is optional at the discretion of the manufacturer.

c. The percent defective allowable (PDA) shall be as specified in MIL-M-38510.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4.1 Group A inspection. Group A inspection shall be in accordance with table I of method 5005 of MIL-STD-883 and as follows:

a. Electrical test requirements shall be as specified in table II herein.

b. Subgroups 4, 5, 6, 7, and 8 of table I of method 5005 of MIL-STD-883 shall be omitted.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883. Electrical test requirements shall be as specified in table II herein.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table III of method 5005 of MIL-STD-883 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Subgroups 7 and 8 shall be added to group C inspection parameters for class B devices and shall consist of the tests, conditions, and limits specified for subgroups 10 and 11 of group A.

c. Steady-state life test (method 1005 of MIL-STD-883) conditions:

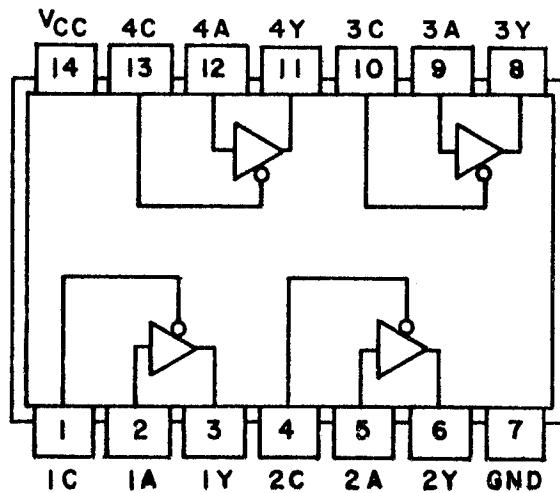
(1) Test condition D or E, using the circuit shown on figure 2, or equivalent.

(2) $T_A = +125^\circ\text{C}$ minimum.

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

Device type 01

Case C and D



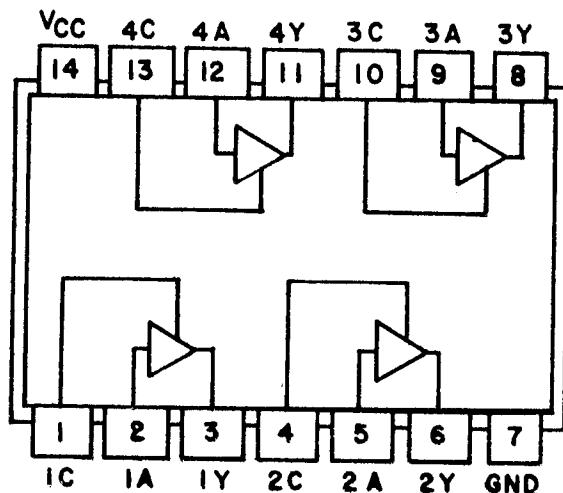
Positive logic:

Y = A

Output is off (disabled) when C is high.

Device type 02

Case C and D

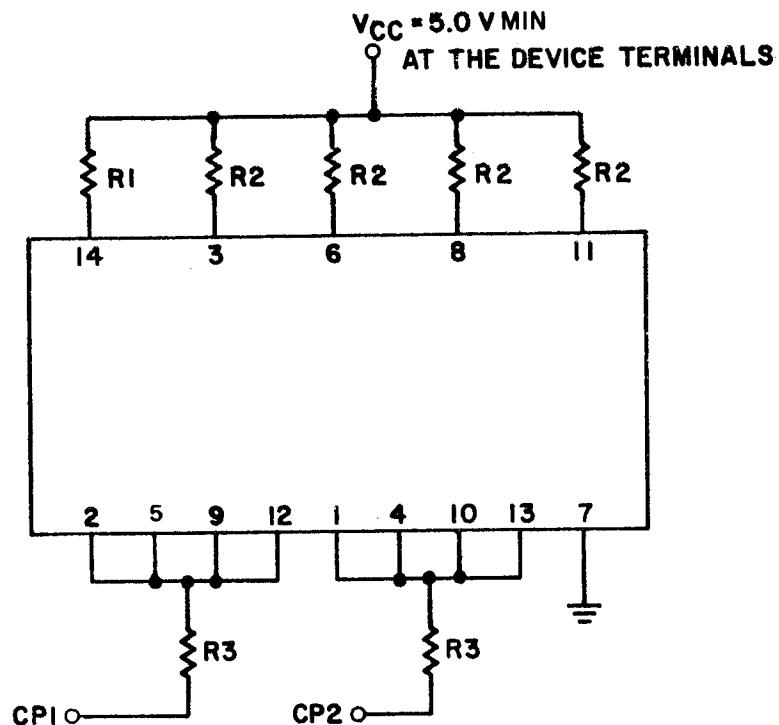


Positive logic:

Y = A

Output is off (disabled) when C is low.

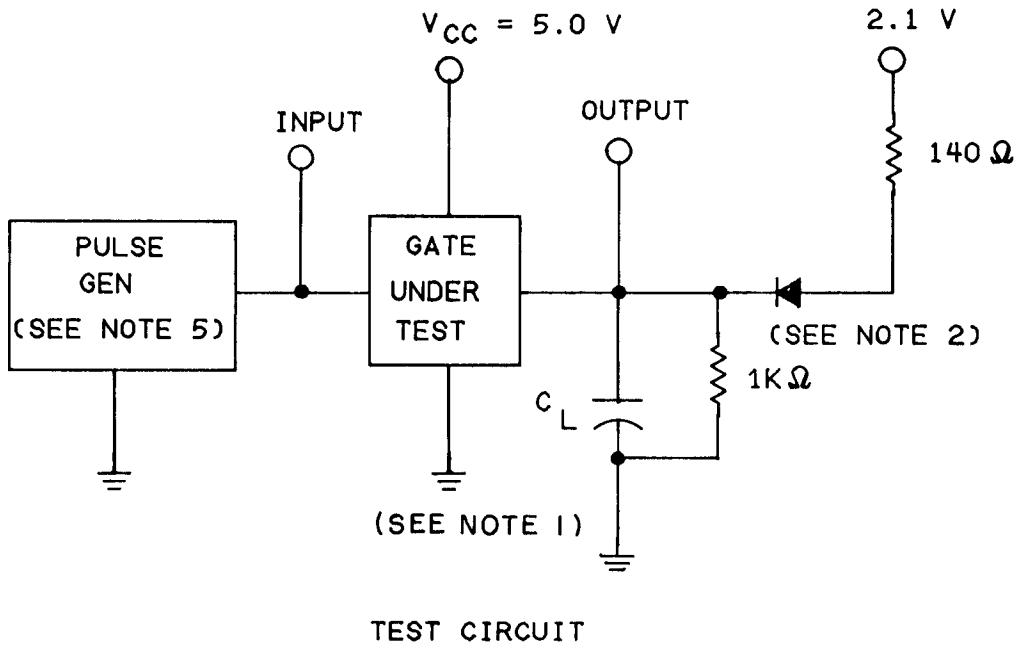
FIGURE 1. Logic diagram and terminal connections.



NOTES:

1. $R_1 = 5 \text{ ohms } \pm 5\%$.
2. $R_2 = 220 \text{ ohms } \pm 5\%$.
3. $R_3 = 27 \text{ ohms } \pm 5\%$.
4. $CP_1 = 0 \text{ to } 3 \text{ V, } 100 \text{ kHz}$.
5. $CP_2 = 0 \text{ to } 3 \text{ V, } 50 \text{ kHz}$.
6. $50\% \pm 15\% \text{ duty cycle (both)}$.

RE 2. Burn-in and life-test circuit for device types 01 and 02.

**NOTES:**

1. $C_L = 50 \text{ pF} \pm 10\%$; including scope probe and jig capacitance.
2. All diodes are 1N3064 or equivalent.
3. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
4. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
5. All input pulses are supplied by generators having the following characteristics:
 $\text{PRR} \leq 1 \text{ MHz}$, $t_p = 500 \text{ ns}$, $Z_{out} \approx 50 \text{ ohms}$, $t_{TLH} = t_{THL} \leq 7 \text{ ns}$, and $V_{gen} = 3.0 \text{ V}$.

FIGURE 3. Switching time test circuit for three-state outputs.

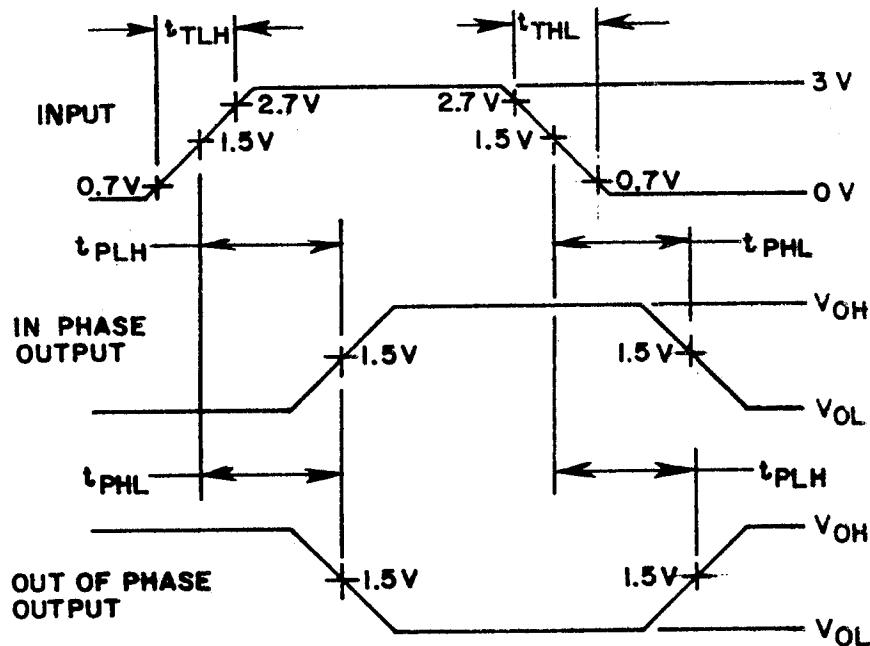
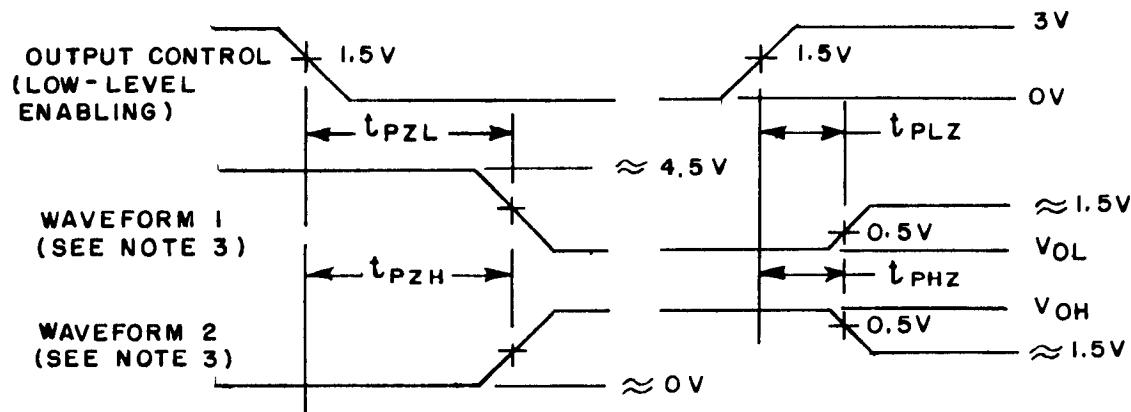
VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMESVOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES, THREE-STATE OUTPUTS

FIGURE 3. Switching time test circuit for three-state outputs - Continued.

TABLE III. Group A inspection for device type 01.
Terminal conditions (pins not designated may be high ≥ 2.0 V, low ≤ 0.8 V, or open).

Subgroup	Symbol	MIL-STD-883 method	Cases C and D				Cases E and F				Cases G and H				Cases I and J				Cases K and L					
			1C	1A	1Y	2C	2A	2Y	GND	3Y	3A	3C	4Y	4A	4C	VCC	1A	1C	2A	2C	3A	3C	4A	4C
$T_C = +25^\circ\text{C}$	V_{IC}	$V_{IH} = 0.8 \text{ V}$	1	4.5 V -12 mA	-12 mA	4.5 V -12 mA	-12 mA	GND	"	"	"	"	"	"	"	4.5 V	1A	1C	2A	2C	3A	3C	4A	4C
			2	4.5 V -12 mA	-12 mA	4.5 V -12 mA	-12 mA	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			3	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			6	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			7	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
V_{OH}		V_{OL}	9	0.8 V	2 V	-2 mA	0.8 V	2 V	-2 mA	0.8 V	-2 mA	2 V	0.8 V	-2 mA	2 V	0.8 V	-2 mA	2 V	0.8 V	-2 mA	2 V	0.8 V	-2 mA	2 V
			10	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			11	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
V_{OL}		$I_{0(off)1}$	13	0.8 V	0.8 V	16 mA	0.8 V	0.8 V	16 mA	0.8 V	0.8 V	16 mA	0.8 V	0.8 V	16 mA	0.8 V	0.8 V	16 mA	0.8 V	0.8 V	16 mA	0.8 V	0.8 V	16 mA
			14	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			15	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
$I_{0(off)1}$		$I_{0(off)2}$	16	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			17	2.0 V	0.8 V	2.4 V	2.0 V	0.8 V	2.4 V	2.0 V	0.8 V	2.4 V	2.0 V	0.8 V	2.4 V	2.0 V	0.8 V	2.4 V	2.0 V	0.8 V	2.4 V	2.0 V	0.8 V	2.4 V
			18	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
$I_{0(off)2}$		I_{IH1}	19	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			20	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			21	2.0 V	2.0 V	0.4 V	2.0 V	2.0 V	0.4 V	2.0 V	2.0 V	0.4 V	2.0 V	2.0 V	0.4 V	2.0 V	2.0 V	0.4 V	2.0 V	2.0 V	0.4 V	2.0 V	2.0 V	0.4 V
$T_C = -55^\circ\text{C}$		V_{IH2}	22	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			23	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			24	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			25	GND	5.5 V	5.5 V	GND	5.5 V	5.5 V	GND	5.5 V	5.5 V	GND	5.5 V	5.5 V	GND	5.5 V	GND	5.5 V	GND	5.5 V	GND	5.5 V	GND
			26	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			27	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			28	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			29	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
$T_C = -40^\circ\text{C}$		I_{IH2}	30	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			31	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			32	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			33	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V	5.5 V	2.4 V
			34	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			35	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			36	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			37	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
$T_C = 100^\circ\text{C}$		I_{IH3}	38	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			39	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			40	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			41	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND
			42	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			43	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			44	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			45	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
$T_C = 150^\circ\text{C}$		I_{IH3}	46	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND	2.4 V	GND
			47	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
			48	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"

TABLE III. Group A inspect
Terminal conditions (pins not designated) -
device type 01 - Continued.
② by high ≥ 2.0 V, low ≤ 0.8 V, or open).

Subgroup	Symbol	IMIL- STD-883 method	Cases C and D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured Terminal	Limits	Unit
		Test no.		1C	1A	1Y	2C	2A	2Y	GND	3Y	3A	3C	4Y	4A	4C	VCC		Min	Max
1	I _{IL}	T _C = +25°C	49	GND	0.4 V		4.5 V			GND		4.5 V		4.5 V			5.5 V	1A	-7	-1.6 mA
			50	0.4 V	4.5 V		GND	0.4 V	0.4 V			4.5 V		4.5 V			"	1C	"	"
			51	"	"		4.5 V	4.5 V	"		0.4 V	GND		4.5 V			"	2A	"	"
			52	"	"		4.5 V	4.5 V	"		0.4 V	GND		4.5 V			"	3A	"	"
			53	"	"		4.5 V	4.5 V	"		4.5 V	GND		0.4 V	GND		"	4A	"	"
			54	"	"		4.5 V	4.5 V	"		4.5 V	GND		0.4 V	GND		"	4C	"	"
			55	"	"		4.5 V	4.5 V	"		4.5 V	GND		0.4 V	GND		"	"	"	"
			56	"	"		4.5 V	4.5 V	"		4.5 V	GND		0.4 V	GND		"	"	"	"
2	I _{CC} I _{OS}	T _C = 30.11	57	4.5 V	GND	4.5 V	GND	4.5 V	GND			GND		4.5 V	GND		4.5 V			
			58	GND	4.5 V		GND	4.5 V						GND			V _{CC}	54	"	"
			59	"	"		"	"						GND			2Y	-30	-70	"
			60	"	"		"	"						GND			3Y	"	"	"
			61	"	"		"	"						GND			4Y	"	"	"

2 Same tests, terminal conditions, and limits as for subgroup 1, except $T_C = 125^\circ\text{C}$.

3 Same tests, terminal conditions, and limits as for subgroup 1, except $T_C = -55^\circ\text{C}$.

Subgroup	Symbol	IMIL- STD-883 method	Cases C and D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured Terminal	Limits	Unit
		Test no.		1C	1A	1Y	2C	2A	2Y	GND	3Y	3A	3C	4Y	4A	4C	VCC		Min	Max
9	t _{PHL}	T _C = +25°C	3003 Fig. 3	62	GND	IN	OUT	GND	IN	OUT	GND	IN	OUT	GND	OUT	IN	GND	5.0 V	1A to 1Y	2
			63	"	"		"	"		"	"		"	"	"	"	2A to 2Y	"	18	
			64	"	"		"	"		"	"		"	"	"	"	3A to 3Y	"	"	
			65	"	"		"	"		"	"		"	"	"	"	4A to 4Y	"	"	
	t _{PLH}		66	GND	IN	OUT	GND	IN	OUT									1A to 1Y	"	13
			67	"	"		"	"									2A to 2Y	"	"	
			68	"	"		"	"									3A to 3Y	"	"	
			69	"	"		"	"									4A to 4Y	"	"	
	t _{PZH}		70	IN	5.0 V	OUT	IN	5.0 V	OUT									1C to 1Y	"	17
			71	"	"		"	"									2C to 2Y	"	"	
			72	"	"		"	"									3C to 3Y	"	"	
			73	"	"		"	"									4C to 4Y	"	"	
	t _{PZL}		74	IN	0.0 V	OUT	IN	0.0 V	OUT									1C to 1Y	"	25
			75	"	"		"	"									2C to 2Y	"	"	
			76	"	"		"	"									3C to 3Y	"	"	
			77	"	"		"	"									4C to 4Y	"	"	
	t _{PHZ}		78	IN	5.0 V	OUT	IN	5.0 V	OUT									1C to 1Y	"	16
			79	"	"		"	"									2C to 2Y	"	"	
			80	"	"		"	"									3C to 3Y	"	"	
			81	"	"		"	"									4C to 4Y	"	"	
	t _{P LZ}		82	IN	0.0 V	OUT	IN	0.0 V	OUT									1C to 1Y	"	15
			83	"	"		"	"									2C to 2Y	"	"	
			84	"	"		"	"									3C to 3Y	"	"	
			85	"	"		"	"									4C to 4Y	"	"	
10	t _{PHL}	T _C = +125°C	86	GND	IN	OUT	GND	IN	OUT									1A to 1Y	"	22
			87	"	"		"	"									2A to 2Y	"	"	
			88	"	"		"	"									3A to 3Y	"	"	
			89	"	"		"	"									4A to 4Y	"	"	
	t _{PLH}		90	GND	IN	OUT	GND	IN	OUT									1A to 1Y	"	16
			91	"	"		"	"									2A to 2Y	"	"	
			92	"	"		"	"									3A to 3Y	"	"	
			93	"	"		"	"									4A to 4Y	"	"	

TABLE III. Group A inspection for device type 01 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V, low ≤ 0.8 V, or open).

Subgroup	Symbol	MIL-STD-883 method	Cases C and D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits	Unit
		Test no.	Test no.	1C	1A	1Y	2C	2A	2Y	GND	3Y	3A	3C	4Y	4A	4C	VCC	Min	Max	
$T_C = +125^\circ C$	t_{PZH}	3003 Fig. 3 "	94 95 96 97	IN	5.0 V	OUT	IN	5.0 V	OUT	GND	"	"	"	"	"	"	5.0 V	1C to 1Y " to 2Y " to 3Y " to 4Y	2 " " " "	ns
	t_{PZL}	" " " 101	98 99 100 101	IN	0.0 V	OUT	IN	0.0 V	OUT	"	"	"	"	"	"	"	"	1C to 1Y " to 2Y " to 3Y " to 4Y	30 " " " "	"
	t_{PHZ}	" " " 102	102 103 104 105	IN	5.0 V	OUT	IN	5.0 V	OUT	"	"	"	"	"	"	"	"	1C to 1Y " to 2Y " to 3Y " to 4Y	21 " " " "	"
	t_{PLZ}	" " " 106	106 107 108 109	IN	0.0 V	OUT	IN	0.0 V	OUT	"	"	"	"	"	"	"	"	1C to 1Y " to 2Y " to 3Y " to 4Y	20 " " " "	"

11 Same tests, terminal conditions, and limits as for subgroup 10, except $T_C = -55^\circ C$.

TABLE III. Group A inspection for device type 02.
Terminal conditions (pins not designated may be high ≥ 2.0 V, low ≤ 0.8 V, or open).

Subgroup	Symbol	MIL-STD-883 method	Cases C and D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits	Unit
$T_C = +25^\circ C$	V_{IC}	1	GND	-12 mA													4.5 V	1A	-1.5 V	
		2	-12 mA														"	1C	"	
		3															"	2A	"	
		4															"	3A	"	
		5															"	3C	"	
		6															"	4A	"	
		7															"	4C	"	
		8															"			
V_{OH}		3006	9	2.0 V	2.0 V	-2 mA											"	1Y	2.4	"
		"	10														"	2Y	"	
		11															"	3Y	"	
		12															"	4Y	"	
																	"			
																	"			
																	"			
																	"			
V_{OL}		3007	13	2.0 V	0.8 V	16 mA	2.0 V	0.8 V	16 mA	0.8 V	2.0 V	16 mA	0.8 V	2.0 V	2.0 V	"	"	1Y	0.4	"
		"	14														"	2Y	"	
		15															"	3Y	"	
		"	16														"	4Y	"	
																	"			
																	"			
																	"			
																	"			
$I_{O(off)1}$		17	0.8 V	0.8 V	2.4 V	0.8 V	0.8 V	2.4 V	"	"	2.4 V	0.8 V	0.8 V	2.4 V	0.8 V	2.0 V	"	5.5 V	40 μA	"
		18															"	1Y	2Y	"
		19															"	3Y	"	
		20															"	4Y	"	
																	"			
																	"			
																	"			
																	"			
$I_{O(off)2}$		21	0.8 V	2.0 V	0.4 V	0.8 V	2.0 V	0.4 V	"	"	0.4 V	2.0 V	0.8 V	0.4 V	2.0 V	0.8 V	"	1Y	-40	"
		22															"	2Y	"	
		23															"	3Y	"	
		24															"	4Y	"	
																	"			
																	"			
																	"			
																	"			
I_{IH1}		3010	25	5.5 V	5.5 V	"	"	"	"	"	"	"	"	"	"	"	"	1A	100	"
		"	26	5.5 V	"	"	"	"	"	"	"	"	"	"	"	"	"	1C	"	
		"	27	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2A	"	
		"	28	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2C	"	
		"	29	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3A	"	
		"	30	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3C	"	
		"	31	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4A	"	
		"	32	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4C	"	
I_{IH2}		"	33	GND	5.5 V	GND	5.5 V	"	"	"	"	"	"	"	"	"	"	1A	100	"
		"	34	5.5 V	"	"	"	"	"	"	"	"	"	"	"	"	"	1C	"	
		"	35	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2A	"	
		"	36	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2C	"	
		"	37	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3A	"	
		"	38	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3C	"	
		"	39	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4A	"	
		"	40	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4C	"	
I_{IH3}		"	41	2.4 V	2.4 V	GND	2.4 V	2.4 V	"	"	GND	GND	"	"	"	"	"	1A	40	"
		"	42	2.4 V	GND	2.4 V	2.4 V	2.4 V	"	"	GND	GND	"	"	"	"	"	1C	"	
		"	43	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2A	"	
		"	44	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2C	"	
		"	45	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3A	"	
		"	46	"	"	"	"	"	"	"	"	"	"	"	"	"	"	3C	"	
		"	47	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4A	"	
		"	48	"	"	"	"	"	"	"	"	"	"	"	"	"	"	4C	"	

TABLE III. Group A inspection for device type 02 - Continued.
Terminal conditions (pins not designated may be high ≥ 2.0 V, low ≤ 0.8 V, or open).

Subgroup	Symbol	MIL-STD-883 method	Cases C and D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits	Unit
$T_C = +25^\circ C$	IIL	3009	49	2.4 V	0.4 V	4.5 V		GND	3Y	3A	3C	4Y	4A	4C	V _{CC}		5.5 V	1A	-1.6 mA	
	"	"	50	0.4 V	4.5 V	2.4 V	0.4 V											1C	-	"
	"	"	51															2A	-	"
	"	"	52															2C	-	"
	"	"	53															3A	-	"
	"	"	54															3C	-	"
	"	"	55															4A	-	"
	"	"	56															4C	-	"
	ICC	3005	57	GND	2.4 V	4.5 V	GND	GND										V _{CC}	-	"
	I _{OS}	3011	58	GND	4.5 V	2.4 V	4.5 V	GND										2Y	-	"
2		"	59															3Y	-	"
		"	60															4Y	-	"
		"	61																	"
2 Same tests, terminal conditions, and limits as for subgroup 1, except $T_C = 125^\circ C$.																				
3 Same tests, terminal conditions, and limits as for subgroup 1, except $T_C = -55^\circ C$.																				
$T_C = +25^\circ C$	t _{PHL}	3003 Fig. 3	62	5.0 V	IN	OUT	5.0 V	IN	OUT	GND	"	OUT	IN	5.0 V	OUT	IN	5.0 V		5.0 V	1A to 1Y 2A to 2Y 3A to 3Y 4A to 4Y
	"	"	63																	2
	"	"	64																18	
	"	"	65																nS	
	t _{PLH}	"	66	5.0 V	IN	OUT	5.0 V	IN	OUT	"	"	OUT	IN	5.0 V	OUT	IN	5.0 V			"
	"	"	67																	"
	"	"	68																	"
	"	"	69																	"
	t _{PZH}	"	70	IN	5.0 V	OUT	IN	5.0 V	OUT	"	"	OUT	IN	5.0 V	OUT	IN	5.0 V			"
	"	"	71																	"
4	t _{PZL}	"	72																	"
	"	"	73																	"
	"	"	74	IN	0.0 V	OUT	IN	0.0 V	OUT	"	"	OUT	5.0 V	IN	OUT	5.0 V	IN		18	
	"	"	75																	"
	"	"	76																	"
	"	"	77																	"
	t _{PHZ}	"	78	IN	5.0 V	OUT	IN	5.0 V	OUT	"	"	OUT	5.0 V	IN	OUT	5.0 V	IN		25	
	"	"	79																	"
	"	"	80																	"
	"	"	81																	"
5	t _{PLZ}	"	82	IN	0.0 V	OUT	IN	0.0 V	OUT	"	"	OUT	5.0 V	IN	OUT	5.0 V	IN		IC to 1Y 12C to 2Y 13C to 3Y 14C to 4Y	
	"	"	83																	"
	"	"	84																	"
	"	"	85																	"
	t _{PHL}	"	86	5.0 V	IN	OUT	5.0 V	IN	OUT	"	"	OUT	0.0 V	IN	OUT	0.0 V	IN		IC to 1Y 12C to 2Y 13C to 3Y 14C to 4Y	
	"	"	87																	"
	"	"	88																	"
	"	"	89																	"
	t _{PLH}	"	90	5.0 V	IN	OUT	5.0 V	IN	OUT	"	"	OUT	IN	5.0 V	OUT	IN	5.0 V	IN	16	
	"	"	91																	"
6	t _{PHL}	"	92																	"
	"	"	93																	"
	t _{PLH}	"	94																	"
	"	"	95																	"
	t _{PLZ}	"	96																	"
	"	"	97																	"
	t _{PHZ}	"	98																	"
	"	"	99																	"
	t _{PLZ}	"	100																	"
	"	"	101																	"
7	t _{PHL}	"	102																	"
	"	"	103																	"
	t _{PLH}	"	104																	"
	"	"	105																	"
	t _{PLZ}	"	106																	"
	"	"	107																	"
	t _{PHZ}	"	108																	"
	"	"	109																	"
	t _{PLZ}	"	110																	"
	"	"	111																	"
8	t _{PHL}	"	112																	"
	"	"	113																	"
	t _{PLH}	"	114																	"
	"	"	115																	"
	t _{PLZ}	"	116																	"
	"	"	117																	"
	t _{PHZ}	"	118																	"
	"	"	119																	"
	t _{PLZ}	"	120																	"
	"	"	121																	"
9	t _{PHL}	"	122																	"
	"	"	123																	"
	t _{PLH}	"	124																	"
	"	"	125																	"
	t _{PLZ}	"	126																	"
	"	"	127																	"
	t _{PHZ}	"	128																	"
	"	"	129																	"
	t _{PLZ}	"	130																	"
	"	"	131																	"
10	t _{PHL}	"	132																	"
	"	"	133																	"
	t _{PLH}	"	134																	"
	"	"	135																	"
	t _{PLZ}	"	136																	"
	"	"	137																	"
	t _{PHZ}	"	138																	"
	"	"	139																	"
	t _{PLZ}	"	140																	"
	"	"	141																	"
11	t _{PHL}	"	142																	"
	"	"	143																	"
	t _{PLH}																			

TABLE III. Group A inspection for device type 02 - Continued.
Terminal conditions (pins not designated may be high $\geq 2.0\text{ V}$, low $\leq 0.8\text{ V}$, or open).

Subgroup	Symbol	MIL-STD-883 method	Cases C and D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal	Limits	Unit
10 $T_C = +125^\circ\text{C}$	t_{pzH}	Fig. 3 " " " "	94 95 96 97	IN 5.0 V OUT	1A 1Y 2C 2A	1Y 2C 2A	2Y GND	3Y 3A	3C 4Y	4A 4C	V _{CC}						5.0 V 1IC to 1Y " " " " 2C to 2Y 3C to 3Y 4C to 4Y	22 ns " " " " " " " " " " " "	ns " " " " " " " " " " " "	
	t_{pzL}	" " " "	98 99 100 101	IN 0.0 V OUT	IN 0.0 V OUT	IN 0.0 V OUT	GND " " "	OUT 5.0 V IN	OUT 5.0 V IN	OUT 0.0 V IN	OUT 0.0 V IN						1IC to 1Y " " " " 2C to 2Y 3C to 3Y 4C to 4Y	30 " " " " " " " " " " " "	" " " " " " " " " " " "	
	t_{phZ}	" " " "	102 103 104 105	IN 5.0 V OUT	IN 5.0 V OUT	IN 5.0 V OUT	GND " " "	OUT 0.0 V IN	OUT 0.0 V IN	OUT 0.0 V IN	OUT 0.0 V IN						1IC to 1Y " " " " 2C to 2Y 3C to 3Y 4C to 4Y	31 " " " " " " " " " " " "	" " " " " " " " " " " "	
	t_{plZ}	" " " "	106 107 108 109	IN 0.0 V OUT	IN 0.0 V OUT	IN 0.0 V OUT	GND " " "	OUT 5.0 V IN	OUT 5.0 V IN	OUT 0.0 V IN	OUT 0.0 V IN						1IC to 1Y " " " " 2C to 2Y 3C to 3Y 4C to 4Y	27 " " " " " " " " " " " "	" " " " " " " " " " " "	

11 Same tests, terminal conditions, and limits as for subgroup 10, except $T_C = -55^\circ\text{C}$.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

4.5 Methods of inspection. Methods of inspection shall be specified as follows:

4.5.1 Voltage and current. All voltages given are referenced to the microcircuit ground terminal. Currents given are conventional and positive when flowing into the referenced terminal.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Ordering data. The acquisition document should specify the following:

- a. Complete part number (see 1.2).
- b. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.
- c. Requirements for certificate of compliance, if applicable.
- d. Requirements for notification of change of product or process to the contracting activity in addition to notification to the qualifying activity, if applicable.
- e. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action and reporting of results, if applicable.
- f. Requirements for product assurance options.
- g. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements shall not apply to direct purchase by or direct shipment to the Government.
- h. Requirements for "JAN" marking.

6.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-M-38510, MIL-STD-1331, and as follows:

GND - - - - -	Ground zero voltage potential.
V _{IN} - - - - -	Voltage level at an input terminal.
I _{IN} - - - - -	Current flowing into an input terminal.

6.4 Logistic support. Lead materials and finishes (see 3.3) are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class B (see 1.2.2), lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

6.5 Substitutability. The cross-reference information below is presented for the convenience of users. Microcircuits covered by this specification will functionally replace the listed generic-industry type. Generic-industry microcircuit types may not have equivalent operational performance characteristics across military temperature ranges or reliability factors equivalent to MIL-M-38510 device types and may have slight physical variations in relation to case size. The presence of this information shall not be deemed as permitting substitution of generic-industry types for MIL-M-38510 types or as a waiver of any of the provisions of MIL-M-38510.

Military device type	Generic-industry type
01	54125
02	54126

6.6 Manufacturers' designators. Manufacturers' circuits which form a part of this specification are designated with an "X" as shown in table IV herein.

TABLE IV. Manufacturers' designations.

Device type	Circuit	
	A	B
01	X	
02	X	X

6.7 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:
 Army - ER
 Navy - EC
 Air Force - 17

Preparing activity:
 Air Force - 17

Review activities:
 Army - AR, MI
 Navy - SH, OS, TD
 Air Force - 11, 19, 85, 99
 DLA - ES

(Project 5962-0789)

User activities:
 Army - SM
 Navy - AS, CG, MC

Agent:
 DLA - ES